The Effect of Alcohol-Intoxication on Emotion Perception and Emotion Perception Ability: Investigating Possible Gender Differences

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Statement of Sources

I declare that this report is my own original work and the contributions of others have been duly acknowledged.

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Carly James
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List of Acronyms

ACS-AF	Advanced Clinical Solutions - Affect Naming
AUDIT	Alcohol Use Disorders Identification Test
AMT	Alcohol Myopia Theory
BAES	Biphasic Alcohol Effects Scale
BMI	Body Mass Index
BrAC	Breath Alcohol Concentration
BRS	Beverage Rating Scale
ERT	Emotion Recognition Scale
FIML	Full Information Maximum Likelihood
K10	Kessler Psychological Distress Scale
SEQ	Social Emotional Questionnaire
TBI	Traumatic Brain Injury
TLFB	Timeline Follow-Back

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Abstract

Alcohol-related violence is as an issue of high concern for society, where alcohol-related violence has shown to be considerably higher in males relative to females. Although a relationship between alcohol and aggression has been established, the underlying social cognitive mechanism are still not fully understood. This study sought to investigate possible gender differences in emotion recognition under the influence of an acute administration of high-dose alcohol, across a range of basic emotion types and intensity levels. Fifty-five males and fifty-five females were quasi-randomly assigned to either a placebo or alcohol-intoxication condition (BrAC mean = 0.074%, *SD* = .019). Emotion perception abilities were measured using the Emotion Recognition Task (ERT). The study found there were no gender differences in emotion recognition ability in the alcohol or placebo condition. However, there were subtle differences in the pattern of deficits within each gender, specifically females were worse at identifying fear and sadness whilst intoxicated, whereas males were worse at detecting fear, but not sadness. Overall it appears that a person's gender has little influence on social perception abilities when intoxicated, and thus may not be an underlying factor contributing to higher rates of alcohol-related violence or other negative social behaviours among males.

Alcohol-related violence is an issue that has received considerable media attention in recent years and is of high concern to society. The National Drug Household Strategy Survey (NDHSS) estimated in 2007, one in four Australians were a victim of alcohol-related verbal abuse and 4.5% of Australians aged 14 years and over had been physically abused by someone under the influence of alcohol (AIHW, 2008). Crime report statistics also indicate perpetrators of violent crimes are more likely to have been intoxicated than perpetrators of non-violent crimes (Murdoch & Ross, 1990). These are alarming statistics given alcohol is one of the most commonly consumed drugs in the world (WHO, 2017).

Alcohol-intoxication involves the ingestion of alcohol (methanol), which results in an increase in Blood Alcohol Concentration (BrAC), measured by the amount of alcohol present in the bloodstream (WHO, 2017). Alcohol-intoxication has been added to the Diagnostic and Statistical Manual of Mental Disorder-5: (DSM: 5, 5th ed., 2013) as a substance-induced disorder resulting in clinically significant maladaptive behavioural or psychological changes. Signs and symptoms of alcohol-intoxication include; slurred speech, incoordination, unsteady gait, nystagamus, impairment in attention and memory and stupor or coma. Alcohol-intoxication is distinct from Alcohol Use Disorder which is included in the DSM-5 as a spectrum of harmful drinking patterns, including alcohol dependence, alcohol abuse and risky drinking (DSM: 5 fifth ed., 2013).

There has been research demonstrating that alcohol can increase aggression (Bushman & Cooper, 1990; Moss & Tartar, 1993; Pihl, 1983) and impair information processing and motor performance (Hull & Bond, 1986). Despite these negative effects, many people continue to consume alcohol for its positive effects, including relaxation, elevated mood and social ease (Dolder et al., 2017), thus indicating the

existence of a complex relationship between alcohol-intoxication and social behaviour (Taylor, 1993). While the underlying mechanisms of negative social behaviours when intoxicated in particular, remain poorly understood, there is growing interest in the research literature on the associated social cognitive dysfunction (e.g., Dolder et al., 2017). Although to thoroughly investigate the role social cognitive dysfunction may play in negative social behaviours, it is important to consider the moderating effect of certain groups, particularly since alcohol-related violence is greater in certain groups within the population.

There is evidence that the rate of alcohol-related violence is considerably higher in young men compared to young women, where males (6%) are estimated to be twice as likely as females (3%) to report being physically abused by someone under the influence of alcohol (AIHW, 2008). Research also suggests alcohol may be involved in over half of male-to-female violent incidents (Perkins, 2002). This suggests an important distinction between males and females in terms of how they may interact or be influenced by alcohol-intoxication.

Alcohol Myopia Theory

One leading theory that has been used in an attempt to explain the poor social behaviours that are thought to result from alcohol-intoxication is Alcohol Myopia Theory (AMT). AMT explains the social effects of alcohol-intoxication based on a general impairment of perception and thought rather than specific alcohol pharmacology effects (Steele & Josephs, 1990). AMT proposes that whilst intoxicated a higher proportion of attention is dedicated to more salient cues and less attention devoted to weaker cues, resulting in ‘short-sighted’ information processing. AMT purports that whilst intoxicated, the ability to accurately perceive cues within the environment is distorted, which may increase the likely occurrence of a number

of negative behaviours (Steele & Josephs, 1990).

Several studies have tested the legitimacy of AMT. One recent study in particular examined AMT by investigating central and peripheral attention (foveal and parafoveal, respectively) for intoxicated and non-intoxicated participants (Bayless & Harvey, 2017). Participants were presented with an array of coloured circles and asked to simultaneously count flashes on a central fixation point. It was found scores for the "central" task (counting flashes in the centre of the display) did not differ between conditions, however scores for the peripheral tasks (detecting colour and location of stimuli around the periphery of the display) were lower for the alcohol group. This demonstrates support for AMT and the notion that alcohol-intoxication narrows attentional focus to the central components of a task (Bayless & Harvey, 2017).

An additional study by Steele and Southwick (1985) demonstrated support for the concept of drunken excess (i.e., the tendency to make behaviour more extreme or excessive) using AMT. It was reasoned that the effects of alcohol myopia may depend on inhibitory conflict, a type of response conflict involving conflicting and ultimately incompatible pressures from both instigating and inhibiting cues (Berlyne, 1960). It was demonstrated that when intoxicated participants are presented with a strong inhibitory conflict, social behaviour is made more extreme due to alcohol's tendency to impair inhibitory ability. It was also found that as alcohol dosage increased, responses only became more extreme with high conflict situations, suggesting inhibitory conflict may mediate alcohol's social effects (Steele & Southwick, 1985). In regards to alcohol-related aggression, it is likely inhibitory conflicts will exist in social situations that encourage drinking behaviour (e.g., a bar). For example, an individual may be conflicted between instigator cues

(encouragement from other parties involved) and inhibitory cues (negative consequences of their actions).

Social Cognition

AMT can be used to explain social cognitive impairments when intoxicated, through a narrowing of attention (Steele & Josephs, 1990). For example, poor emotion recognition may relate to the inability to perceive an emotion as salient, where attention may focus on other more salient information within the environment. In addition, inhibitory conflict may be reflective of social inhibition (i.e., the ability to inhibit automatic responses so responses are more socially acceptable), where behaviour becomes more excessive due to an inability to process inhibitory cues or inhibitory control (i.e., aggression or violence).

Social cognition is a broad term that relates to the ability to interpret and perceive the intentions and dispositions of others, including perception, categorization, recollection and evaluation of social stimuli (Brothers, 1990; Schaller & Rauh, 2017), which engages several psychological processes that ultimately guide behaviour (Kennedy & Adolphs, 2012). There are a number of neural structures implicated in social cognitive mechanisms. Firstly, it is clear the amygdala plays an important role in emotional and social behaviour (Adolphs, 2001) and recent research suggests it may play a more pivotal role in the saliency or relevance of psychological stimuli (Adolphs, 2010). It has also been shown primary and association somatosensory cortices are involved with social perception processes, the hypothalamus, brain-stem nuclei, basal ganglia and motor cortices are involved with enactment of the social behaviour and a network consisting of the amygdala, prefrontal cortex, cingulate cortex and right somatosensory cortices are involved in the mediation of perception and cognitive processing (Adolphs, 2001). In addition,

prefrontal cortices have been implicated in a number of social cognitive processes such as response selection, decision-making and volitional control of behaviour (Adolphs, 2001; Bechara, Damasio, A. Damasio, A.R., Anderson, 1994).

Emotion recognition is a lower-order social cognitive ability that involves the ability to perceive emotional expressions in others (i.e., through their facial expressions). Six universal emotions, which have been the focus of most prior research of social cognition (in both clinical and non-clinical groups), include sadness, anger, surprise, disgust, fear and surprise (Ekman, 1992). These emotions have also been regarded as universally recognisable, which indicates a possible underlying biological component to the emotion perception ability that is not restricted to cultural learning alone (Ekman, 1992).

Accurate appraisals of emotional expressions are crucial for effective social interaction and help to facilitate communication (Patterson, 1999). As such, the inability to accurately decode facial emotional expressions may contribute to poor social behaviour (Phillippot et al., 1999). For instance, research investigating functionality after traumatic brain injury (TBI) has found a significant positive relationship between social integration and emotional expression interpretation ability for TBI patients (Knox & Douglas, 2009). Poor facial emotional recognition has also been associated with more functional impairments in individuals with Schizophrenia, including work functioning and independent living (Kee, Green, Mintz, & Brekke, 2003). There is a clear link between damage to the brain regions commonly associated with emotional recognition and poorer social integration, highlighting the importance of accurate interpretation of emotion.

Common brain regions associated with emotion perception include the amygdala, pre-frontal gyrus, insular cortex, pre-frontal cortex, anterior cingulate

gyrus and somatosensory cortex (Phillips et al., 2003). (Adolphs et al., 2000). The amygdala has been recognised as a central structure for the recognition of emotional information and lesions studies have demonstrated impaired emotional recognition performance following bilateral damage to the amygdala (Adolphs et al., 1999). Although facial recognition within the brain is complex, research has shown there are some specific neurobiological pathways that may be associated with certain emotions, particularly negative valenced emotions (Blair et al., 1999). The amygdala appears to be particularly involved with the processing of fear (Adolphs, Tranel, Damasio, & Damasio, 1995) and the insula with disgust (Wicker et al., 2003; Phillips & Young, 1997). Many clinical studies on emotional recognition have shown negative emotions have been particularly affected (Williams & Wood, 2010), suggesting a profound link between these distinguished brain regions and emotional recognition. Interestingly, the same brain regions that are associated with emotional recognition are also commonly compromised under alcohol-intoxication (Magrys & Olmstead, 2014).

The Relationship between Alcohol and Social Cognition

Research has shown frontal and temporal brain regions are compromised during acute alcohol administration (Magrys & Olmstead, 2014). As such, the cognitive, social cognitive and affective processes that are thought to be mediated by these frontal and temporal brain regions may play a role in the negative social behaviours seen in alcohol-intoxication. Several studies have investigated the effects of alcohol-intoxication on social cognitive abilities, however results have been mixed. Preliminary research has demonstrated *alcoholic* individuals misinterpret facial emotion expressions more than non-alcoholics and are poor at accurately evaluating their emotion perception performance (Phillippot et al., 1999). A more

recent meta-analysis of social cognition in *Alcohol Use Disorder* concluded facial emotion recognition in this group of individuals is severely impaired, especially for the negative valence emotions of anger and disgust (Bora & Zorlu, 2017). Alcoholics also tend to overestimate the intensity of emotional expressions conveyed and mislabel sad emotions as more hostile (Frigerio, 2002). This misinterpretation of emotion in others could lead to an overreaction in response resulting in poor social behaviour and aggression (Phillippot et al., 1999).

It has been suggested that emotional recognition deficits in alcoholics and individuals under the influence of alcohol is due, in part, to a compromised amygdala and insula (Gorka, Fitzgerald, King, & Phan, 2013). One study investigated the functional connectivity between the amygdala and pre-frontal cortex (PFC) whilst under the influence of alcohol in heavy social drinkers (Gorka, Fitzgerald, King, & Phan, 2013). The results indicated prolonged alcohol use reduced the functional pairing between the amygdala and right orbitofrontal cortex (OFC) whilst the participant was processing angry and fearful faces, and the left OFC while processing happy faces. It was suggested the social effects demonstrated under the influence of alcohol might be mediated by the functional connections between the amygdala and OFC during the processing of emotional faces (Gorka, Fitzgerald, King, & Phan, 2013). As such, the reduced connectivity between the amygdala and right OFC whilst intoxicated may impair the ability to detect salient information about threat, resulting in increased likelihood of alcohol-related harm (Gorka, Fitzgerald, King, & Phan, 2013). However, a limitation of this study is that by recruiting heavy social drinkers, it makes it difficult to differentiate whether these effects are due to alcohol use disorder or intoxication. For example, the underlying neuropathology between alcohol-intoxication and alcohol-use disorder is distinct, where alcohol use disorder

is associated with long-term structural (Harding et al., 1996) and functional changes (Weiland et al., 2014) from heavy drinking patterns and alcohol-intoxication has only relatively short-term effects. However, the previous research on alcohol-use disorder may inform further research investigating alcohol-intoxication.

Additional studies found no differences in emotion perception under *alcohol-intoxication*, for example Walter et al (2011) found no effect of low dose alcohol (0.4g/kg) on the detection and interpretation of angry and happy facial expressions. In this study participants were asked to indicate when they could identify the emotion gradually presented from a neutral expression. Further research using a similar threshold detection paradigm, demonstrated comparable results across happy, angry, fearful, disgusted and neutral emotional expression, whilst under a higher alcohol dose (0.4 and 0.8g/kg) (Kamboj, 2013). Additionally, Kano et al (2003) found no significant difference in a discrimination task of sad, surprised and angry morphed facial expressions from a neutral expression, with a number of varying alcohol dosages (0, 0.14, 0.28, 0.56 g/kg).

It has been suggested the inconsistent results demonstrated in the emotion recognition literature are due to methodological differences, specifically the use of static vs. dynamic faces and intensity levels. Research on emotional recognition has previously used static, high intensity facial expressions to determine accuracy of encoder (Ekman, 1999). It has been suggested this method may result in ceiling effects that can decrease the tests sensitivity or neglect valuable information by failing to recognise subtle differences in performance (Kessels et al., 2014). More recent research has used the Emotion Recognition Task (ERT), which employs dynamically morphed facial expressions presented at different intensity levels (Montagne, Kessels, DeHaan, & Perrett, 2007). Research demonstrates morphed or

dynamic presentations of facial expressions are more representative of emotions presented in everyday communications (Kamachi et al., 2001). In addition, it has also been found that using incremental intensities of facial expressions reduces ceiling effects on most emotions (Kessels et al., 2014; Rosenberg, McDonald, Dethier, Kessels, & Westbrook, 2014).

In order to address some of the limitations of previous studies, Honan et al. (submitted) investigated emotional expression in *alcohol-intoxicated* individuals across a range of different emotion intensity levels. The study found intoxicated individuals had a reduced ability to detect fearful and sad emotional expressions displayed at moderate-to-high intensity levels. It was concluded these reduced abilities may contribute to the poor social behaviour and aggression often witnessed with alcohol-intoxication. It was reasoned that successful emotion perception ability is important as it encourages self-monitoring and allows for adequate opportunity to modify their behavioural response, which may reduce the potential for negative social behaviours (Honan et al., submitted). However, one important limitation of this study is the possible effects of gender were not taken into account.

Gender Differences in Emotional Recognition

An important consideration of the effect of alcohol-intoxication on emotion perception abilities is how this relationship may be mediated by gender. Given gender differences in alcohol-related behaviours do exist, it is possible there are underlying differences in social cognitive abilities, which in turn would provide some explanation for these gender-biased negative behaviours. Indeed, there have been several prior studies that have investigated gender differences in the ability to accurately interpret emotional facial expressions. Kessels et al., (2014) found adult females had a general advantage in recognising facial emotional expressions

compared to males. Montagne et al. (2007) found similar results with females performing better than their male counterparts in recognising specific negative valence facial emotional expressions including anger and disgust. While one research study found no gender differences in facial emotion perception ability (Grimshaw, Bulman-Fleming, & Ngo, 2004), Hoffman et al. (2010) reasoned this discrepant result was due to methodological differences. In particular, Hoffman et al. (2010) suggested women may be more adept at recognising subtle emotional expressions than males and this was based on their finding that women were better at recognising emotions displayed at lower (but not full) intensity levels. Given the high frequency of subtle emotional displays in everyday social interaction, this finding is highly important and relevant. Tasks, which assess a person's ability to perceive facial emotional expressions across various intensity levels, therefore, are considered to be more ecologically valid. This research suggests women may have a specific advantage in recognising subtle, negative emotions in particular, compared to males. However, it is not clear whether this effect remains with alcohol-intoxicated individuals.

The interaction of alcohol with gender is extremely complicated. It has been demonstrated there are gender differences in metabolism of alcohol, progression of alcoholism, drinking patterns, hormones levels and psychiatric comorbidities (Ruiz & Oscar-Berman, 2013). These gender-related factors, may invariably moderate the relationship between alcohol-intoxication and social behaviours. It remains possible that any pre-existing gender differences in emotional perception ability are enhanced in alcohol-intoxicated individuals. That is, based on what we know about males being poorer than females at identifying negatively valanced facial emotional perception tasks (Kessels et al., 2014), males may continue to perform more poorly

than females on emotion perception tasks when affected by acute levels of alcohol-intoxication. Such a finding may also provide explanation for the higher rate of aggressive social behaviours found in intoxicated males (AIHW, 2008).

Gender, Emotional Recognition, and Alcohol-Intoxication

Attwood et al. (2008) investigated the effects of a low dose of acute alcohol-intoxication on the perceptual threshold for a number of emotional expressions of varying intensity levels. It was found intoxicated males (0.4g/kg alcohol) had a significantly higher perceptual threshold for sad facial expression, when compared to alcohol-intoxicated females. However, they found no gender differences for the processing of angry facial expressions (Attwood et al., 2008). This discrepant result may have been due to the methodology used, which is notably different to previous studies demonstrating gender differences in emotional recognition (Kessels et al., 2014) For example, Attwood et al. (2008) employed a two-alternative forced choice task for angry, sad and happy emotional expressions. Participants had to identify the relevant emotion from the stimulus-absent (neutral) and stimulus-present (expressive) faces. This was presented repeatedly to determine the participant's average threshold for each emotion. On the other hand, Kessels et al., (2014) used identification of different emotions to determine accuracy of recognition rather than a perceptual threshold for each emotion type.

As indicated above, previous research examining alcohol-intoxication has typically applied low-to-moderate doses of alcohol. The current study provides a unique perspective by using a high dosage of alcohol to allow for important insights into the effects of alcohol at a higher, binge drinking level. The National Institute on Alcohol Abuse and Alcoholism defines binge drinking as BrAC of 0.08% or above (NIAA, 2004). This level of drinking has been associated with a higher rate of health

risk behaviours (Miller et. al., 2007) predominantly due to the positive relationship between BrAC and impairment.

Aims and Hypotheses

Few studies have explicitly examined whether gender differences exist for emotional recognition ability when experiencing the acute effects of alcohol-intoxication. The goal of this study therefore is to expand on our prior findings of a specific impairment in high-dose alcohol-intoxicated participants for the detection of fear and sadness in others, by investigating potential gender differences in facial emotional recognition using the ERT. A second aim of this study is to examine gender differences in emotion perception ability across various intensity levels of facial emotion expressions. It was hypothesised that:

HI: Consistent with the findings of Honan et al. (submitted) there will be specific impairments in the detection of fearful and sad facial emotional expressions in alcohol-intoxicated participants across moderate-to-high facial emotional expression intensity levels (i.e., 60-100%).

H2: Alcohol-intoxicated females will correctly label more facial emotional expressions than alcohol-intoxicated males at low emotional intensities (i.e., 20-60%). There will be no within alcohol condition gender difference at high emotional intensities (i.e., 80-100%). This is hypothesised based on the findings of Hoffman et al. (2010) who suggest women are more adept at recognising more subtle emotional expressions than males.

H3: Alcohol-intoxicated females will more accurately recognise negative valence emotions (i.e., anger, sadness, disgust), compared to alcohol-intoxicated males, especially for fearful and sad facial emotional expression. This is based on the finding that detection of these negative emotions is impaired in alcohol-intoxicated

individuals (Honan et al., submitted), and that males generally are more impaired in the detection of negatively valanced emotions (Kessels et al., 2014).

Method

Design

This study is a 2 (condition) x 2 (gender) x 6 (emotion type) x 5 (emotion intensity) mixed design cross-sectional study. Participants were quasi-randomly allocated to one of two conditions (alcohol-intoxication or placebo) counterbalancing for gender, using a single-blind procedure. The design contained two between-group independent variables (*condition*: placebo and alcohol; *gender*: male and female) and two within-group independent variables (*emotion type*: sad, happy, angry, disgust, fear and surprise; and *emotion intensity*: 20, 40, 60, 80, 100%) and one dependent variable (correct identification of emotions).

Participants

The final sample included 110 participants (55 females and 55 males) between the ages of 18 and 35 years (M = 23.38, *SD* = 4.05). The experimental condition had 57 participants (28 females, 29 males) (See Table 1 for participant's basic demographic information and inferential statistics). A 2 (*condition*: alcohol, placebo) x 2 (*gender:* male, female) factorial ANOVA determined there were no significant differences between groups on age or education. A chi-square test of goodness-of fit indicated no significant differences in the proportion of males and females in the alcohol and placebo condition.

Participants were recruited through advertisements placed around the University of Tasmania Newnham campus and the wider community. Undergraduate psychology students were recruited through SONA (a secure online research participation website), presentations in first year psychology lectures and flyers

positioned across the University campus (See Appendix B). Psychology students received three hours course credit, while all other participants received a Village Cinemas movie voucher for participation.

An *a-priori* power analysis using G*power 3.1.9.2 (Faul et al., 2007) was conducted prior to recruiting participants to determine the minimum sample size needed to detect significant effects. Hoffman et al. (2008) study on gender differences in emotional recognition and subtle expression intensities (d = 1.12) and Honan et al. (submitted) study on emotional expression perception under the influence of alcohol (sadness, d = 1.21; fear, d = 1.56) were used as estimates of effect size. Using the lowest effect size estimation (Cohen's d = 1.12), a power level of .90 and a more conservative alpha level of .01, a minimum of 97 participants were required to detect a significant effect.

Exclusion criteria included: regular tobacco smoker (typical daily use of one or more cigarettes), recent illicit drug use (preceding six months), current regular medicinal or recreational prescription medication (except contraceptive medication), participation in a drug study in the preceding three months, history of any significant neurological condition (e.g., traumatic brain injury, epilepsy), current diagnosis of any significant physical condition (e.g., hypertension), current diagnosis of a significant psychiatric disorder or score of 30 or higher on the K10 (Kessler et al., 2002), or history of alcohol/drug abuse or dependence disorder or use of alcohol at hazardous or harmful levels, evident via a score of 16 or higher on the AUDIT (Saunders et al., 1993). Participants must have consumed at least two standard alcoholic beverages in the past month (determined by the TLFB), be fluent in English, completed Year 10 or equivalent, have normal or corrected-to-normal vision and a Body Mass Index (BMI) in the range 18.5 to 29.9.

Materials

Screening Measures

Kessler Psychological Distress Scale (K10; Kessler et al., 2002): The K10 contains 10 self-report questionnaire items intended to measure non-specific levels of psychological distress based on the individual's feelings within the past 30 days. An item example is “During the last 30 days how often did you feel hopeless”. The questions are rated on a 5-point Likert Scale ranging from 1 (*none of the time*) to 5 (*all of the time*). Scores for each item are summated to give a maximum ‘psychological distress’ score of 50. Participants with scores greater than 30 (indicating high psychological distress), were excluded from the study. The K10 has good internal consistency (Cronbach’s $\alpha = .84$), as demonstrated by patients admitted to Emergency Departments for alcohol consumption (Arnaud et al., 2010).

Alcohol Use Disorders Identification Test: Self-Report Version (AUDIT; Saunders et al., 1993*)*: The AUDIT consists of 10 self-report questions relating to alcohol consumption, drinking behaviour, alcohol dependence and alcohol-related problems. The AUDIT was developed by the World Health Organisation (WHO) as a screening tool for hazardous and harmful patterns of alcohol consumption. Each question is scored from zero to four, which is totalled to give a maximum score of 40. An example item is “How often in the last year have you found you were not able to stop drinking once you started”. Scores greater than eight are considered to indicate risky alcohol consumption. However, as this study required some alcohol consumption for participation, participants with scores above 16 were excluded. Several studies have validated the AUDIT for use as a screening tool for Alcohol Use Disorder (Adewuya, 2005; Kallmen et al., 2014; Bradley et al., 2003).

Table 1

Descriptive and Inferential Statistics for Demographic Data

	Alcohol		Placebo		Inferential Statistics			
	Male	Female	Male	Female	F / χ^2	*df*	*p*	Cohens *d*/ Cramer's V
Gender	29 (50.9%)	28 (49.1%)	26 (49.1%)	27 (50.9%)	0.03	1	.849	0.02
Age	24.41 (4.81)	23.54 (4.38)	23.35 (3.82)	22.15 (2.68)				
Condition					2.55	1, 106	.113	0.31
Gender					1.82	1, 106	.180	0.26
Condition × Gender					0.04	1, 106	.836	0.00
Education	11.83 (0.47)	11.82 (0.55)	11.77 (0.82)	11.81 (0.56)				
Condition					0.03	1, 106	.779	0.05
Gender					0.01	1, 106	.865	0.03
Condition × Gender					0.12	1, 106	.823	0.00

Note: For gender, frequency values are noted with proportion of participants in each condition provided in brackets. For Age and Education, mean values are shown with standard deviation (*SD*) values provided in brackets. Respective main and interaction effects for age and education are also shown. Condition = Main effect of condition (alcohol, placebo); Gender = Main effect of gender (male, female); Condition × Gender = Condition and Gender Interaction. df = degrees of freedom.

The AUDIT has shown excellent internal consistency (Cronbach's α = .094), within a Psychological Care Centre for Alcohol and Drugs (Meneses-gaya et al., 2002).

Timeline Follow-Back (TLFB; Sobell et al., 1986*)*: The TLFB is a self-report measure of participants' drinking behaviour over the preceding month. The TLFB was used to ensure participants have prior and recent exposure to alcohol (two standard drinks in the last month), in order to limit adverse participant effects and control confounding effects due to lack of exposure. It was also used to ensure participants had not consumed alcohol in the 24 hours prior to their participation in this study. Participants are presented with a calendar and asked to provide retrospective estimates of the number of standard drinks consumed for each day over the last month. The TLFB has been shown to be a psychometrically sound measure of alcohol use within the general population as well as a useful clinical measure to aid in diagnosis and treatment (Agrawal et al., 2008; Sobell et al., 1986).

Manipulation Check Measures

Beverage Rating Scale (BRS; Fillmore & Vogel-Sprott, 2000*)*: The BRS is used to measure participants perceived level of alcohol-intoxication at the conclusion of the experiment. The BRS is used as a manipulation check to determine whether participants could distinguish between the alcohol and placebo drink. Participants are asked to report their perceived alcoholic consumption in relation to number of bottled beers (containing 4.8% alcohol) on a scale of zero to ten bottles of beer. The BRS has been used in previous alcohol-intoxication research as a manipulation check (Fillmore & Vogel-Sprott, 1999).

Biphasic Alcohol Effects Scale (BAES; Martin, Earleywine, Musty, Perrine, & Swift, 1993*)*: The BAES is a self-report measure of the subjective stimulant and sedative effects of alcohol. Participants are asked to rate their feelings of sedative

(e.g., “sluggish” and “heavy head”) and stimulant effects (e.g., “elated” and “up”) on an 11-point Likert scale ranging from 1 (*not at all*) to 10 (*extremely*). Responses are summed to create a total stimulant and sedative score. The BAES has strong psychometric properties, including high internal consistency (α = 0.85-0.94) and a supporting factor structure for two distinct stimulant and sedative constructs in a sample of students with experience in alcohol consumption.

Baseline Assessments

Social Emotional Questionnaire (SEQ; Bramham, Morris, Hornak, Bullock, & Polkey, 2009): The SEQ contains 24 items designed to measure social emotional functioning. The subscale emotion recognition (5 items) was used to assess participants self-reported emotion recognition ability. Each item is rated on a 5-point Likert Scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An item example is “I notice when other people are sad”. The scores for each of the five items were summed to create a total emotion recognition score. Support for the validity of the SEQ to measure social and emotional functioning has been reported, in which the self-report version demonstrated marginally adequate internal consistency (Cronbach’s α = 0.69), and good construct validity determined through a factor analysis (Bramham et al., 2009).

Advanced Clinical Solutions Affect Naming (ACS-AN; NCS Pearson, 2009*)*: The ACS-AN is a simple task of emotion recognition ability utilising 100% intensity levels for all emotion types. Participants are shown 24 coloured pictures of faces expressing six basic emotions and a neutral expression, they are then asked to identify the emotion from a list of seven possible ‘emotions’ presented on a separate sheet. All the correct items are summed together to create a total score (ranging from 0 to 24). The ACS-AN will be used to ensure no pre-existing group differences in

emotion recognition ability. The ACS-AN has been used as a reliable measure of social cognitive functioning in a number of clinical samples (Valmas, Mosher Ruiz, Gansler, Sawyer, & Oscar-Berman, 2014).

Experimental Task

Emotion Recognition Task (ERT; Montagne, Kessels, DeHaan, & Perrett, 2007): The ERT is designed to measure an individual's ability to recognise the six basic emotions (sadness, happiness, anger, fear, disgust and surprise). Each emotion is presented on a computer screen using a video morphing technique whereby emotions emerge from a neutral expression. The emotions are displayed at five varying levels of intensity (20%, 40%, 60%, 80% and 100%). Participants are asked to label the emotion using a six-emotion type forced-choice response format. There are 120 emotions in total (two female and two male faces shown at each intensity level for each emotion). The duration of each morphed video ranged from 0.31 milliseconds for the 20% emotions, to 1.3 seconds for the 100% emotions. The emotions are presented in a predetermined random order to be displayed at 20% increments, beginning at 20% intensity to control for priming effects. Three practice trials are administered prior to testing commencement. The ERT takes approx. 12-min to administer. The ERT is useful for detecting subtle impairments in emotion perception (Montagne et al., 2007) and has been validated for use in a number of clinical groups, such as Obsessive-Compulsive Disorder (OCD) (Montagne et al., 2008), Post Traumatic Stress Disorder (PTSD) (Poljac, Montagne & De Haan, 2011), Schizophrenia (Scholten, Aleman, Montagne & Khan, 2005) and Frontotemporal dementia (Kessels et al., 2007).

Procedure

Individuals interested in participating completed eligibility screening

assessments on SurveyMonkey, directed through SONA or email correspondence. Pre-screening questions related to demographic information, relevant medical history and prior alcohol consumption, the K10 (Kessler et al., 2002) and AUDIT (Saunders et al., 1993). Following eligibility confirmation, participants were phoned to discuss the study in detail and to arrange a time for their participation in an experimental session. Participants were asked to abstain from alcohol for four hours, caffeine eight hours and over the counter medications 24 hours prior to the experiment, and nicotine and illicit drugs for the duration of the experiment. Participants were asked to consume two slices of bread/toast (with their choice of spread) one hour prior to the testing session to help account for individual differences in metabolic rates. This was provided by the researchers if not feasible for participants. Participants were asked to consume a light meal, lacking any high fat or dairy products prior to the fasting period and to limit their water intake for four hours prior to the experimental session.

Participants were provided with an information sheet (See Appendix D) and written informed consent (See Appendix E) was received prior to conducting the experiment. Current height, weight, and a BrAC reading was taken prior to testing to ensure eligibility and to determine the correct alcohol dosage for each participant. The breathalyser used was a tested and calibrated Andatech hand-held Alcolmeter ‘Prodigy’, Serial Number 13002816, owned by the University of Tasmania. A declaration of abstinence (See Appendix F) was also obtained to ensure participants had abstained from the necessary substances for the required period. All participants then consumed a 150ml placebo drink, containing soda water, Angostura® aromatic bitters and lime syrup before completing the baseline measures. The administration of this beverage was intended to control for expectancy effects when completing

baseline assessment tasks, including the SEQ, ACS-AN and the BAES manipulation check.

Following baseline assessments participants were administered either a 750 ml placebo beverage or a 750 ml beverage containing enough alcohol for them to reach a BrAC of .08%. Widmark Equation (Dry, Burns, Nettelbeck, Farquharson, & White, 2012) was used to determine alcohol dosage (See Appendix G). Ninety ml of lime syrup and 4 ml of Angostura® aromatic bitters was added to both beverages to mask the smell and taste, so it wasn't obvious to participants which condition they were in. The Angostura® aromatic bitters contains 44.7% alcohol by volume, however, previous studies have shown it is not sufficient to affect BrAC readings (Loeber & Duka, 2009). Participants were asked to drink the beverage at a steady pace, allowing 10-minutes to consume the entire beverage. Participants were allowed a maximum of 250 ml of still water throughout the experimental session. Participants then viewed a neutral video (David Attenborough Whale Watching) for the 50-minute absorption period.

Following the 50-minute absorption period a BrAC reading was recorded, where it was expected the participants would be at a peak reading of approximately .08%. Participants then completed the BAES (Martin et al., 1993) to check the manipulation had performed as expected, before completing the ERT. Following the ERT, participants completed a second BAES and the BRS. At the conclusion of the experiment, participants were provided with food, water and entertainment until two consecutive 0.03% BrAC readings (or 0.00% for those holding a provisional license, intending to drive) were recorded.

Statistical Analysis

Statistical analysis of the data was conducted through IBM SPSS Statistics

Version 23. Factorial ANOVA's were run to analyse manipulation check measures (BRS) and to compare groups on baseline tasks. There was an indication of a significant difference on the AUDIT between the alcohol and placebo condition. However, controlling for the AUDIT in the main analyses made no difference to results. Therefore, only the results without controlling for the AUDIT were reported. Alpha levels were maintained at = .05 for baseline measures.

A 2 gender (male and female) × 2 condition (alcohol and placebo) × 3 time (baseline, pre-task and post-task) × 2 subscale (sedation and stimulation) mixed linear models full information maximum likelihood (FIML) analysis with structured covariance was conducted to examine differences between conditions on the BAES. There were no between-group differences for gender so this was removed from the analyses and re-run without gender to simplify interpretation of this manipulation check measure.

A 2 gender (male and female) x 2 condition (alcohol and placebo) x 6 (emotion type) x 5 (emotion intensity) FIML analysis, with hypothesis driven lower-order interaction effects included in the model, was conducted to investigate gender differences in the experimental and control conditions on emotion perception performance across the five intensity levels. Post-hoc pairwise examinations were conducted to examine specific condition and gender interaction effects with a corrected alpha of .01 to minimise possible occurrence of Type I error. Cohen's *d* effect sizes are also reported, where .30 indicates a small effect, .50 a moderate effect, and .80 a large effect size.

All assumptions for analyses were checked. Homogeneity of variance and normality of data was violated for the baseline measure of age. A bootstrapping analysis using 1,000 bias corrected samples was run in view of the violations.

However, this made no difference to the results and thus only the original analysis is reported. It should be noted the Mixed Linear Models FIML approach permits a more robust analysis than more traditional analyses (Enders, 2011).

Results

Eligibility and Baseline Assessments

Factorial ANOVAS indicated there were no significant differences between conditions on the K10, TLFB and ACS-AN. There was a significant main effect of condition on the AUDIT, where the alcohol group (M = 6.96, *SD* = 3.72) scored significantly higher than the placebo group (M = 5.57, *SD* = 5.57), $F(1, 106) = 4.15$, $p = .044$, $d = .39$. For SEQ emotional recognition subscale scores, females (M = 21.01, *SD* = 2.40) scored significantly higher than males (M = 20.57, *SD* = 2.62), $F(1,106) = 0.32$, $p = .030$, $d = .43$. There were no other significant differences on baseline measures. Results of baseline and eligibility assessments are diagrammatically represented in Figure 1.

Manipulation Checks

A 2 (condition) × 2 (gender) factorial ANOVA was conducted to determine any differences between conditions on self-reported perceived level of intoxication (measured by the BRS). There was no main effect of gender, $F(1,106) = 3.31$, $p = .064$. There was a main effect of condition, where participants in the alcohol group (M = 4.43, *SD* = 1.41) reported consuming significantly more alcoholic beverages than those in the placebo group (M = 1.3, *SD* = 1.30), $F(1,106) = 122.41$, $p < .001$, $d = 2.10$. There was no significant interaction between condition and gender on self-reported perceived level of intoxication, $F(1, 106) = 0.21$, $p = .644$.

One-sample t-tests demonstrated both the alcohol and placebos groups

believed they had a significant quantity of alcoholic beverages (i.e., greater than zero), $t(52) = 23.68$, $p < .001$ and $t(52) = 8.95$, $p < .001$, respectively.

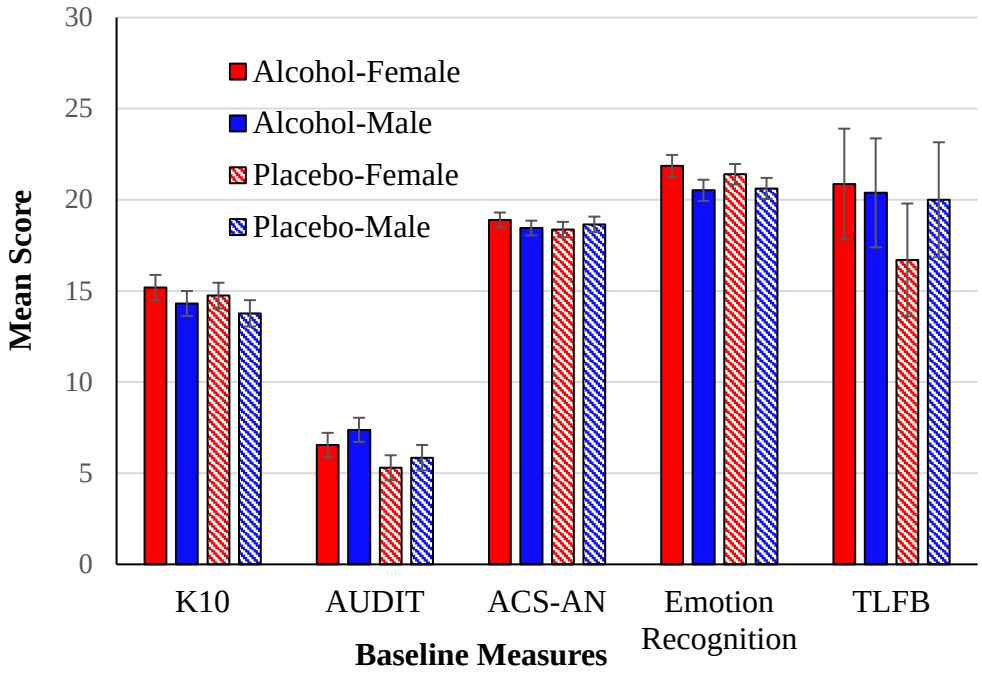

Figure 1. Means and standard deviations for males and females within conditions for baseline measures. *Note.* K10 = Kessler Psychological Distress Scale; AUDIT = Alcohol Use Disorders Identification Test; ACS-AN = Advanced Clinical Solutions-Affect Naming; Emotion Recognition = Self-report emotion recognition measured by the Social Emotional Questionnaire; TLFB = Timeline Follow-back. For full inferential statistics see Appendix A.

For the BAES, FIML mixed models analysis indicated a significant × 2 (condition: alcohol and placebo) × 3 (time: baseline, pre-task and post-task) × 2 (subscale: sedation and stimulation) interaction, $F(4,550) = 12.19$, $p < .001$ (See Figure 2 for a diagrammatical representation). Post-hoc pairwise comparisons indicated no significant difference between the conditions on the sedative [$F(1,321.58) = 0.12$, $p = .726$, $d = .07$] or stimulative subscales [$F(1,321.58) = 0.23$,

p = .631, d = .09] at baseline. At pre-task, participants in the alcohol condition reported significantly higher sedation [F(1,321.58) = 9.64, p = .002, d = .59] and stimulation [F(1,321.58) = 6.77, p = .010, d = .50] relative to those in the placebo group. Post-task, participants in the alcohol condition reported significantly higher sedation [F(I,321.58) = 9.65, p = .002, d = .59] than participants in the placebo condition. Although, there was no significant difference between those in the alcohol group and placebo group for reported stimulation [F(1,321.58) = 2.17, p = .141, d = .28].

BrAC Readings

Participants in the alcohol condition recorded a mean BrAC of 0.074 (SD = .019) immediately prior to the administration of the ERT and 0.076 (SD = .019) at the conclusion of the ERT. A paired sample t-test indicated there was no significant or meaningful difference between readings at the two time points, t(55) = -1.87, p = .067, 95% CI [-.001, -.000]. One-sample t-tests determined BrAC pre-task [t(55) = 29.53, p <.001, 95% CI (.069, .079)] and post task [t(55) = 30.13, p <.001, 95% CI (.071, .081)] were significantly different from zero.

Correlations between ERT Performance and BrAC

In the alcohol group there was a statistically significant moderate negative correlation between BrAC and total scores for sad emotional expressions, r(N = 56) = -.27, p = .042. There were no statistically significant correlations for any of the remaining emotions.

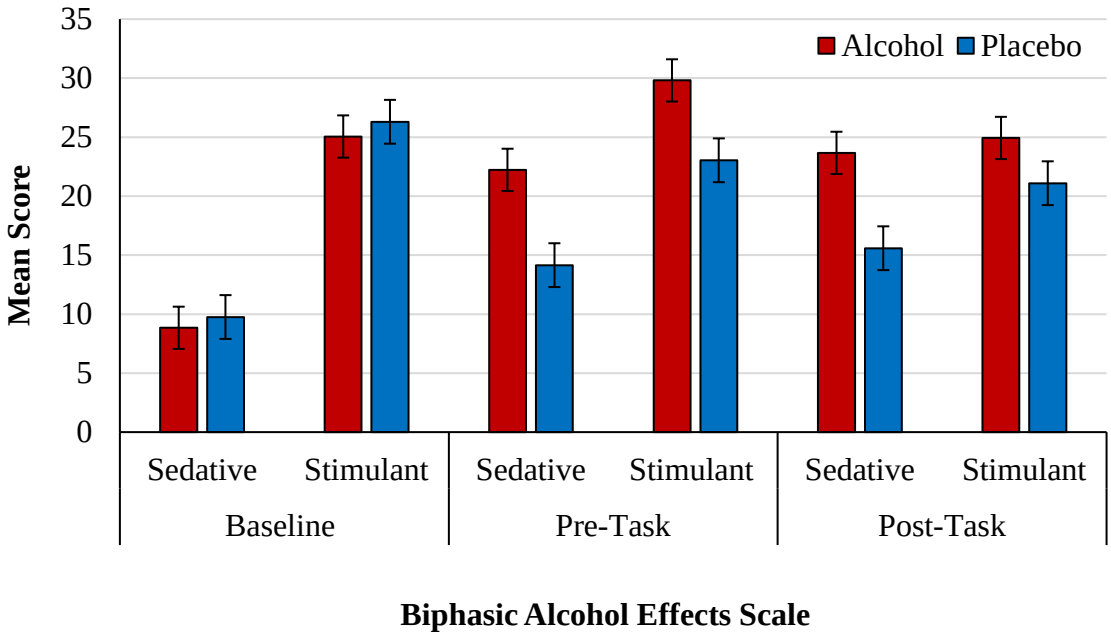

Figure 2. Means and standard errors representing sedative and stimulant effects of alcohol at three time-points, for the alcohol and placebo conditions.

ERT Performance

The FIML mixed models analysis indicated a significant 2 condition × 6 emotion × 5 intensity interaction, $F(40, 3190) = 5.78$, $p < .001$ (See Figure 3). Post-hoc comparisons indicated participants in the alcohol condition were significantly less accurate at identifying fear at 80% [$F(1, 2398.32) = 9.99$, $p = .002$, $d = .60$] and 100% [$F(1, 2398.32) = 9.11$, $p = .003$, $d = .57$] relative to the placebo condition. Participants in the alcohol condition were also less accurate at identifying sadness at 80% [$F(1, 2398.32) = 16.37$, $p < .001$, $d = .77$] and 100% [$F(1, 2398.32) = 9.94$, $p = .002$, $d = .60$] intensity level, relative to the placebo condition. Participants in the alcohol condition were also significantly less accurate at identifying surprise at 40% [$F(1, 2398.32) = 8.39$, $p = .004$, $d = .55$].

There was a significant 2 gender × 2 condition × 6 emotion interaction, $F(20,$

3109) = 192, $p < .001$ (See Figure 4). For males, post-hoc pairwise comparisons indicated participants in the alcohol group were significantly less accurate at identifying fearful emotional expressions [$F(1, 433.74) = 8.90$, $p = .003$, $d = .81$], relative to the placebo condition. For females, post-hoc pairwise comparisons indicated participants in the alcohol group were significantly less accurate at identifying fearful [$F(1,433.74) = 6.61$, $p = .010$, $d = .71$] and sad [$F(1, 433.74) = 15.22$, $p < .001$, $d = 1.07$] emotional expressions, relative to the placebo condition. There were no significant differences between males and females within the placebo or alcohol condition at the .01 level. Across both conditions happy was the easiest emotion to correctly identify, followed by anger, disgust, surprise, sadness and fear (all comparisons were significantly different at the .01 level).

There was a significant 2 gender × 2 condition × 6 emotion × 5 intensity interaction, $F(80, 3190) = 3.37$, $p < .001$ (See Figure 5). For males, post-hoc pairwise comparisons indicated participants in the alcohol group were significantly worse at accurately identifying surprise at 20% intensity level [$F(1, 2385.70) = 7.26$, $p = .007$, $d = .73$] and fear at 80% intensity level [$F(1, 2385.70) = 7.96$, $p = .005$, $d = .76$], relative to the placebo group. There was a trending difference for males in the alcohol group to be significantly worse at identifying sadness at 80%, [$F(1, 2385.70) = 6.18$, $p = .013$, $d = .67$] than those in the placebo condition. For females, post-hoc pairwise comparisons indicated participants in the alcohol condition were significantly worse at identifying sadness at 60% [$F(1, 2385) = 13.51$, $p < .001$, $d = 1.01$], 80% [$F(1, 2385.70) = 10.85$, $p = .001$, $d = 0.90$] and 100% [$F(1, 2385.70) = 9.22$, $p = .002$, $d = .84$] intensity levels, relative to the placebo group. There were no significant differences between males and females within the placebo or alcohol condition at the .01 level. However, there was a trending difference between males

and females in the alcohol group, for sadness at 60% [$F(1, 2385) = 4.74$, $p = .030$, $d = .59$]. There was also a trending difference between males and females in the placebo group for surprise at 80% [$F(1, 2385.70) = 5.00$, $p = .025$, $d = .62$] and disgust at 20% [$F(1, 2385) = 5.06$, $p = .025$, $d = .62$].

Labelling Errors

Table 2 details information about the mislabelling of each emotion type for all conditions. Visual inspection of this information demonstrated the pattern of misclassifications were similar across all conditions. Most notably, participants tended to mislabel fear as surprise. However, this did not work in reverse, as surprise was predominantly mislabelled as happy. There was a similar mislabelling pattern for males and females.

Discussion

The aim of the current study was to investigate potential gender differences in high-dose alcohol-intoxicated individuals on the ability to accurately perceive facial emotional expressions. Gender differences in emotion perception ability across various intensity levels of facial emotion expressions in alcohol-intoxicated individuals was also examined. The first hypothesis that there will be specific impairments for the detection of fearful and sad facial emotional expressions in alcohol-intoxicated participants across moderate-to-high facial emotional expression intensity levels was generally supported. It was found alcohol-intoxicated participants were significantly less accurate at identifying fear and sadness, specifically at 80% and 100% intensity levels, relative to non-intoxicated individuals.

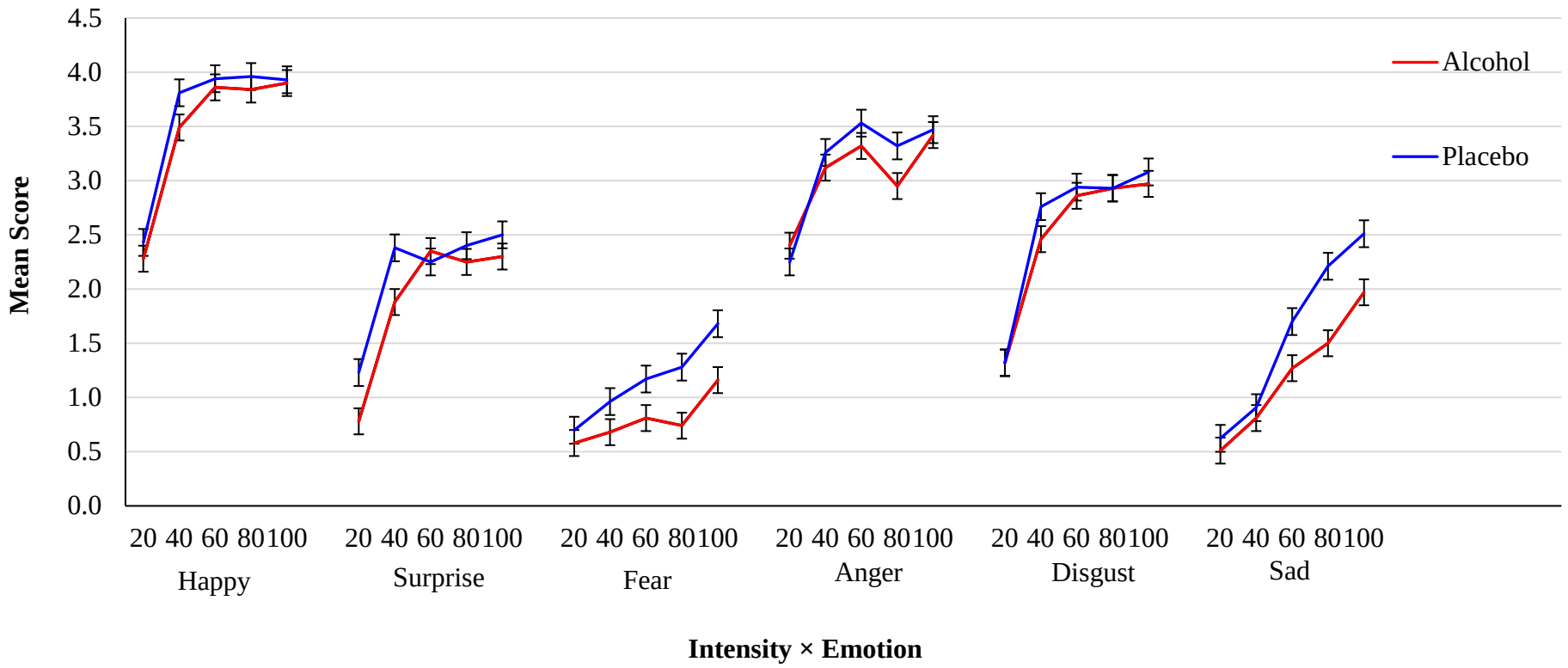

Figure 3. Mean correct identifications of the six basic emotions across the five intensity levels for alcohol and placebo conditions. Note. Error Bars represent standard errors.

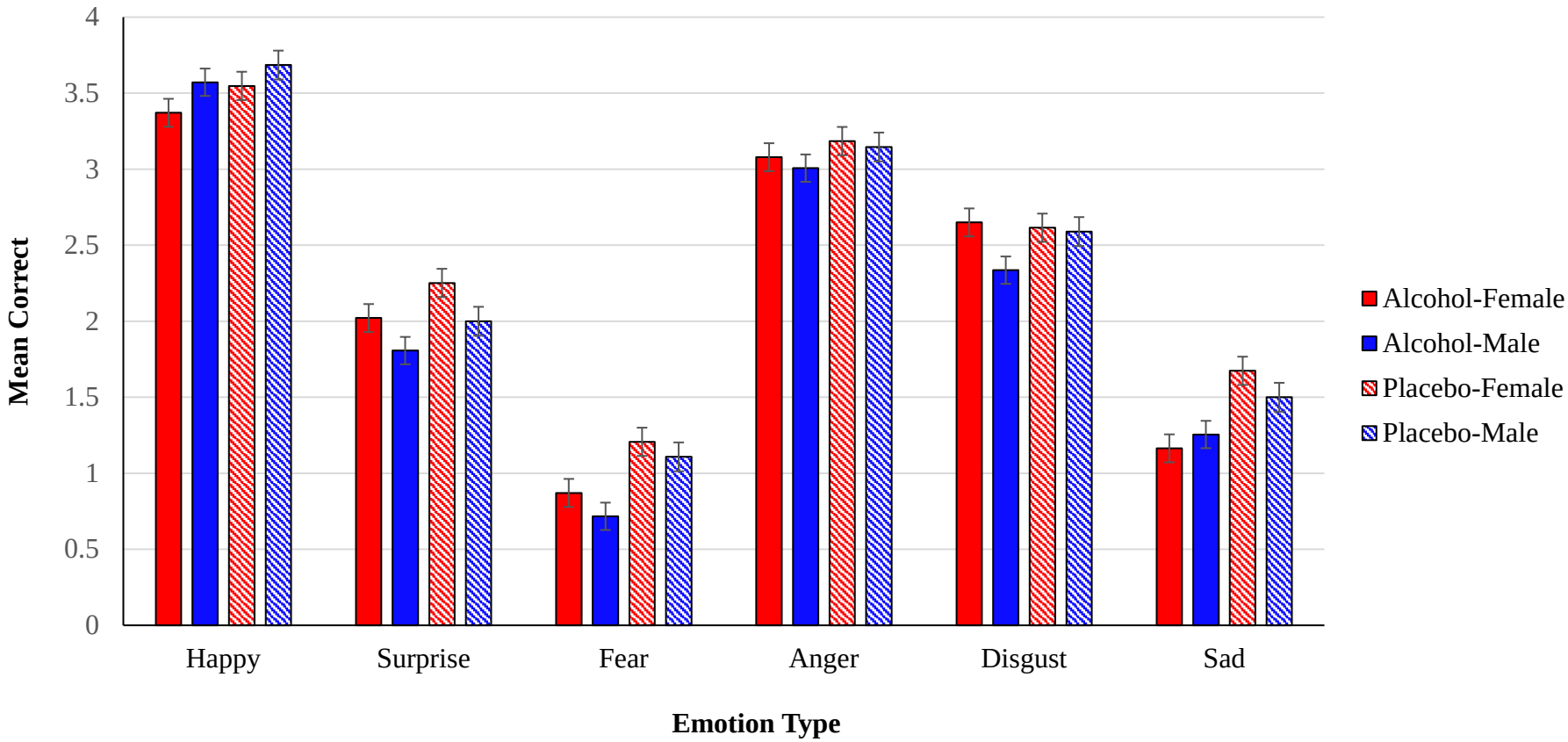

Figure 4. Mean Total Emotion Scores for Males and Females within Alcohol and Placebo Groups. *Note.* Error bars represent standard errors.

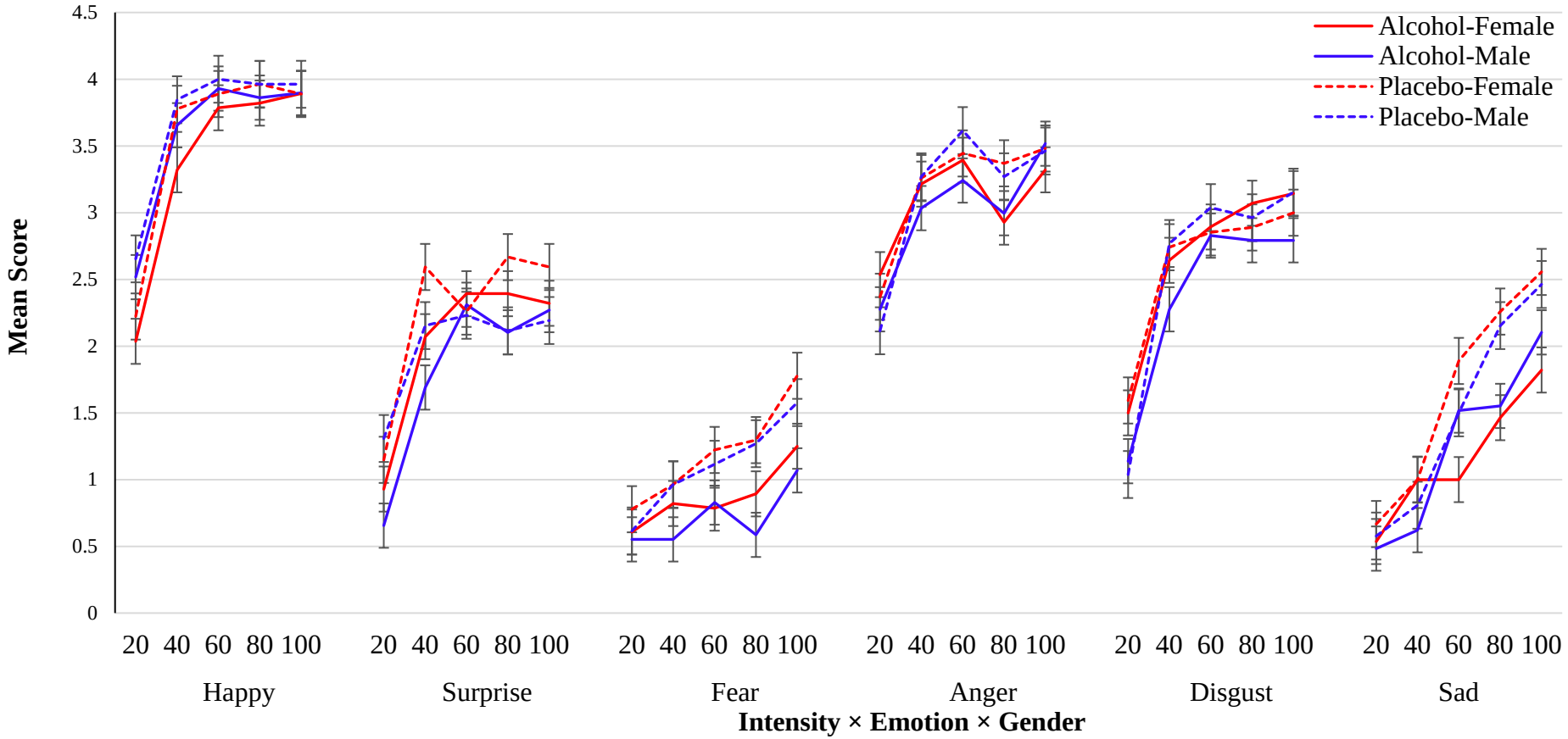

Figure 5. Mean correct identifications of the six basic emotions across the five intensity levels for males and females within the alcohol and placebo conditions. Note. Error Bars represent standard errors.

Table 2

Percentage of Error Types for Condition and Gender for the Six Basic Emotions

Condition	Gender	Actual Emotion	Label provided by participant (%)					
			Happy	*Surprise*	*Fear*	*Anger*	*Disgust*	*Sad*
Alcohol	Female	Happy	**89**	1	1	4	3	2
		Surprise	36	**50**	3	4	4	3
		Fear	7	57	**21**	6	6	3
		Anger	3	4	2	**77**	10	4
		Disgust	4	1	1	25	**66**	3
		Sad	7	16	22	9	17	**29**
	Male	Happy	**84**	2	2	4	6	2
		Surprise	42	**45**	2	5	4	2
		Fear	8	62	**19**	5	3	3
		Anger	5	3	2	**75**	11	4
		Disgust	2	1	1	33	**59**	4
		Sad	7	16	18	12	16	**31**
Placebo	Female	Happy	**89**	2	1	2	4	2
		Surprise	34	**56**	2	2	3	3
		Fear	5	54	**29**	4	4	4
		Anger	2	2	2	**79**	10	5
		Disgust	1	1	1	27	**66**	4
		Sad	5	9	19	9	16	**42**
	Male	Happy	**93**	1	2	1	2	1
		Surprise	41	**50**	3	2	3	1
		Fear	5	56	**29**	5	4	1
		Anger	5	2	2	**79**	9	3
		Disgust	2	1	1	27	**65**	4
		Sad	7	10	21	12	13	**37**

Note. Values are averaged across the five intensity levels rounded to the nearest whole number. The correct responses are provided in bold text.

These results generalise the finding of Honan et al., (submitted) of an impairment for alcohol-intoxicated participants with fear and sadness at 80% and 100%. However, impairment of these emotions at 60% was not demonstrated in the larger sample, and thus the specific impairment for fear and sadness is restricted only to higher levels of emotion perception ability. These results also support the findings of Phillippot et al., (1999), where alcohol-intoxicated individuals misinterpreted more emotions than those not under the influence of alcohol. These findings, however, are not in support of the results of Kamboj, (2013) which found no significant differences between the detection of happy, angry, fearful, disgusted and neutral emotional expressions whilst under the influence of a high alcohol dosage (0.8g/kg) relative to a placebo condition. These contradictory findings may be explained by the notably different methodologies used between the two studies, Kamboj et al., (2013) used a threshold detection paradigm whereas the current study utilised a systematic method of analysing emotion detection performance at a range of intensity levels.

Consistent with the result that alcohol participants were impaired on detecting sad facial emotional expressions, a negative relationship between BrAC and recognition of sad emotional expressions was also detected in this study. This suggests the more intoxicated an individual is, the worse they may be at accurately identifying sad facial expressions. For fearful emotions, no such relationship was detected, despite a significant impairment for the alcohol-intoxicated participants in detecting these emotions.

This lack of relationship between BrAC and fearful emotion expressions on one hand and a relationship between BrAC and sadness on the other hand, implies the ability to detect and interpret sad and fearful emotional facial expressions may be

mediated by differing underlying neurobiological pathways. Consistent with this finding, functional neuroimaging has demonstrated the existence of dissociable, but interconnected systems for the processing of different negative emotion types (Blair et al., 1999). Notably, it has been shown alcohol reduces the functional pairing between the amygdala and right OFC whilst processing fearful emotional expressions (Gorka, Fitzgerald, King, & Phan, 2013). It is possible recognition of these emotions whilst intoxicated impairs the ability to detect threat information as salient resulting in a less comprehensive account of that emotion. In addition, whilst it has been suggested the right amygdala is associated with automatic emotional recognition, some literature supports the involvement of sad emotional recognition predominantly within the left amygdala (Blair et al., 1999; Schneider et al., 1995), where the left amygdala may be involved with a more intentional cognitive emotion processing (Dyck et al., 2011). Further research would need to investigate this seemingly all-or-nothing impairment in fearful emotions, whilst under the influence of alcohol and the likely mechanisms involved.

Participants in the alcohol condition were also significantly less accurate at identifying surprise at 40%. This particular group difference was not detected in Honan et al., (submitted). Further investigation of the misclassifications demonstrated surprise was most commonly misclassified as fear. The confusion between these two emotions could likely be due to similar facial configurations of both expressions (i.e., widening of the mouth and raised eyebrows) (Honan, McDonald, Sufani, Hine, & Kumfor, 2016). Although surprise is often regarded as a positive emotion (Babbage et al., 2011), it also has been described as an emotion lacking clear valence (Kreibig, 2010). Therefore, it is possible the misclassifications of surprise can be explained by confusion in the valence of the emotion. However, it

is apparent that surprise at a moderate level of intensity is further impaired in alcohol-intoxicated participants, compared to controls.

The second hypothesis that alcohol-intoxicated females will correctly label more facial emotional expressions than alcohol-intoxicated males at low emotional intensities (i.e., 20-60%) was not supported. It was found there were no within-condition gender differences at any intensity level, for any emotion type. The finding that there was no significant difference between males and female's emotion recognition ability at low intensity levels is contrary to the findings of Hoffman et al. (2010) who examined gender differences in emotional recognition across various intensity levels. Hoffman et al., (2010) found women were more adept at recognising subtle emotional expressions of anger, disgust and fear relative to males, however there was no gender differences at high intensity levels for either alcohol-intoxicated or placebo participants.

A potential explanation for the discrepant findings for gender differences in emotion perception performance at low intensity levels is any possible female advantages at recognising emotional expressions displayed at low intensities may be diminished under the influence of a high-dose of alcohol. Pharmacokinetic alcohol differences between males and females have been identified, suggesting females may be more vulnerable to the effects of alcohol (Baraona et al., 2001). Specific gender differences have been reported for some cognitive tasks, specifically under high doses of alcohol. For example, it was found that women demonstrated a greater impairment in divided attention tasks relative to men, when consuming an alcohol dosage to produce equivalent BrAC readings of 0.06%. The same impairment was not found at lower BrAC readings (0.03%) (Mills & Bisgrove, 1983). Therefore it is possible any potential gender differences in emotion recognition between males and

females are reduced by a biased cognitive effect of alcohol consumption. In addition, it should be noted the current study utilised a successful placebo controlled condition, and thus is likely not to be comparable to a healthy sample, similar to the one used by Hoffman et al. (2010). This is because expectations of alcohol have been shown to influence behaviour (Lang, Goeckner, Adesso, Marlatt, 1975) and hence could potentially affect performance on the ERT.

The third hypothesis that alcohol-intoxicated females will more accurately recognise negative valenced emotions (i.e., fear and sadness), compared to alcohol-intoxicated males, was also not supported. Although there was a significant impairment of fearful and sad emotional expressions in alcohol-intoxicated participants, this effect was stable across genders. This finding is partially inconsistent with the results of Attwood et al., (2009) which demonstrated male participants had a significantly higher perceptual threshold for sad expressions, compared to female participants but there were no gender differences for angry emotional expressions. This discrepant result could be due to an emotion threshold detection task paradigm, where emotions are labelled at the point where it is first detected as emerging from a neutral expression, in Attwood et al.'s study. The current study employed a more systematic method of investigating emotion perception abilities across a range of emotion types at varying intensity levels. The present results are also inconsistent with Kessels et al., (2014) who found females were more accurate in detecting anger, fear and sadness relative to males using the ERT in healthy participants.

Therefore, a more plausible explanation for the discrepant results for gender differences in negative valence emotions is any possible gender differences are minimised under a high-dose of alcohol. The study provides a unique perspective of

emotion recognition performance at a higher alcohol levels, simulating the likely effects while “binge drinking”. Although BrAC was not recorded in Atwood et al., (2009), the calculations were based on 0.4g/kg, suggesting a substantially lower dose of alcohol to the current study and therefore a likely lower BrAC. It is possible a higher dose of alcohol diminishes any emotional recognition differences, resulting in similar impairments for males and females.

Although there were no between gender effects identified across conditions, there was a subtle difference in the pattern of observed effects within genders. When investigating differences between conditions separately for males and females it was found alcohol-intoxicated females were poorer at correctly identifying sad and fearful emotional expressions than females in the placebo condition. For males, it was found alcohol-intoxicated participants were significantly poorer at correctly identifying fearful emotional expressions than those in the placebo condition, however this same pattern of effect was not seen for sad emotional expressions. These results suggest males are no less accurate at detecting sad emotional expressions under the influence of alcohol but they are less accurate at identifying fearful expressions.

These findings contribute to the existing emotion perception literature, particularly in relation to possible gender differences in the ability to detect emotional facial expressions. It was demonstrated females scored significantly higher on a self-report measure of emotion recognition ability. However, with the results of the ERT, it was apparent self-reported ability did not translate into actual ability. This may suggest why notions such as ‘female intuition’ are popular. In relation to AMT, these findings suggest both males and females are vulnerable to the effects of a restrictive attentional focus when consuming high doses of alcohol. In addition the

neural mechanisms involving alcohol and social cognition appear to be similar for males and females, due to comparable deficits in emotion recognition ability.

In particular, the negative effects of alcohol are shown to be predominant for negatively valenced and 'vulnerable' emotion types (i.e., fear and sadness). These social cognitive dysfunctions may in turn, relate to a number of negative behaviours. For example, it has been shown fearful expressions activate avoidant and submissive behavioural expectations (Adams, Ambady, Macrae, & Kleck, 2006), however if the effects of alcohol negatively impact the recognition of fearful expressions, it may not result in typical behavioural inhibition responses and may even result in inappropriate aggressive responses (Blair, 2005; Eisenberg et al., 1989; Miller & Eisenberg, 1988). This is supported by AMT which purports alcohol can impair inhibitory ability, making behaviour more extreme or excessive (Steele & Josephs, 1990). It should be noted the direct link between emotional recognition and negative social behaviours is still speculative, however there is potential that there is a relationship.

The subtle differences in the pattern of impairments due to alcohol-intoxication within gender groups may have implications for vulnerable individuals, particularly those involved in domestic violence. In these situations, whereas both intoxicated women and men may experience increased difficulty in their ability to identify when a person is fearful, only intoxicated women may experience difficulties in their ability to detect when a person is sad. This suggests that if emotion perception abilities were related to aggressive behaviours, women have the potential to act just as aggressively as men when intoxicated. Indeed there is some indication women may be more affected by alcohol-intoxication than males, given the stronger pattern of deficits for female participants. Therefore, the greater risk of

male domestic violence perpetrators is more likely to be a reflection of the higher rates of drinking among men (Wilsnack et al., 2009).

Limitations and Future Research

There are several limitations associated with this study. First, this study used a between-group design to examine the effects of alcohol on emotion perception ability, which is arguably weaker than a within-group design, (Bordens & Abbott, 2002). For example, in the current study there were some differences between groups in the baseline measures, which would otherwise be removed in a within-subjects design. There were for instance, differences across conditions on scores for the AUDIT, despite quasi-random allocation. However, controlling for the AUDIT in the analysis made no differences to the results. In addition, the mean AUDIT score for the alcohol and placebo condition were much lower than the cut off score of 16 for alcohol dependence and alcohol problems (Saunders et al., 1993), suggesting it is unlikely an underlying alcohol problem is affecting the results. Future research nonetheless could utilise a within-subjects design to control for differences in baseline measures and to replicate the findings of the current study. Despite these limitations the manipulations checks did performe as intended. The lack of condition difference in the BAES at the conclusion of the ERT task is consistent with an effect demonstrated in other high-dose alcohol studies (King, de Wit, McNamara, Cao, 2011).

An important limitation of the ERT task is the presentation of emotions in the absence of social context. Although the current study utilised dynamic facial expressions of emotion, it has been demonstrated additional social cues are important in the recognition and expression of emotions (Hess, Kappas & Banse, 1995). For example, being at a bar compared to a job interview will afford how much the

individual pays attention to social cues and furthermore how the individual self-regulates to communicate and behave appropriately (Hooker & Knight, 2006). Research has shown that facial expressions of emotions depend on the sociality of the context, the relationship between communicators and audience and the underlying emotional state (Hess, Kappas, & Banse, 1995). AMT suggests the effect of alcohol myopia is mediated by attentional components that are affected by internal and external cues (Steele & Jospehs, 1990), which may be impacted by the social situation. Therefore an important area for further research is to investigate gender differences in emotion perception performance in a range of social contexts (i.e., in a bar).

In addition, facial expressions of emotion are not used in isolation to infer emotional states of others. Interpretation of emotion is a multi-modal process that involves touch, tone of voice and non-verbal body movements (Atkinson, Dittrich, Gemmel, & Young, 2004; Schirmer & Adolphs, 2017), to provide individuals with a more holistic perspective about emotional states of others. The ERT is limited by only measuring one component of emotion detection, facial expressions. Further research may investigate whether there is an effect on the integration of multiple emotional modalities, under the influence of alcohol. In terms of gender differences, it has been suggested females process the features of emotional expressions differently to males. Specifically, females may base their emotion recognition judgments on more emotional content, rather than physiological characteristics and utilise a two-factor structure of emotion (i.e., valence and arousal) (Thayer & Johnson, 2000). Therefore it would be valuable to investigate whether males and females differ in interpreting emotional expression within social context and in their collation of multi-modal cues of emotion.

Like most emotion recognition tasks utilised in the literature, the ERT only investigates a limited range of emotions (anger, sadness, happiness, fear surprise and disgust). However, in social situations individuals are not restricted to the use of these basic emotions alone (i.e., contempt, jealousy, excitement). In fact, research has shown alcohol affects the processing of emotional expressions of contempt (Felisberti & Terry, 2015). In addition, the ERT also has a disproportionate number of negative emotions compared to positive, where happiness is the only clear positive emotion (Kreibig, 2010). In order to understand emotional recognition more comprehensively, it would be important to investigate potential differences in the processing of positive valence emotions, using more than one emotion type.

Finally, the ERT lacks evidence for equivalency at particular intensities across emotion types. To explain, there is no evidence to corroborate sadness displayed at the 20% intensity level is comparable to happiness displayed at the 20% intensity level. In light of this, comparisons of differences between emotion types at each intensity level did not make intuitive sense.

The current study also utilised a fairly homogenous sample in relation to the level of alcohol-intoxication and sample population. The study only used a specific high-dose of alcohol (sufficient to reach .08%). Analysis of the BAES demonstrated all participants were under the influence of a high level of alcohol-intoxication, demonstrated by increased stimulation and sedative effects at peak level of intoxication across conditions. Therefore, the findings of this research only translate to individuals under the influence of a high-dose of alcohol. In addition, consistent with the majority of psychological research, the current sample was comprised largely of university students (i.e., a highly educated population). Considering alcohol-related aggression is impacted by socio-economic status, particularly

education (Kraus, Tryggvesson, Pabst & Room, 2015) it would be beneficial to conduct a further study utilising a broader sample.

Lastly, there is some evidence to suggest gender of encoder can affect accurate decoding. Specifically male's were found to be worse at accurately decoding female facial expression of sad and happy emotions (Hess, Blairy, & Kleck, 1997). In addition, males were found to be more accurate than females at recognising expressions of anger on male faces (Rotter & Rotter, 1988). In the present study we balance for this possible effect by presenting each emotion with a male and female face, however, further research could investigate whether a perceptual bias in encoding remains with alcohol-intoxicated participants.

Conclusion

The relationship between high-dose alcohol-intoxication and negative social behaviours has been well recognised. Research on alcohol-related violence has demonstrated males are involved in substantially more alcohol-related incidents than females. However, the social cognitive mechanisms underlying these biased behaviour trends are still unclear. It is likely a deficit in recognising emotional expressions, whilst intoxicated may contribute to negative behaviours. However, the previous literature investigating potential gender differences in emotional recognition have been inconsistent. Research has failed to investigate the deficit in various emotions across a number of intensity levels. In addition, the existing literature has not specifically investigated whether the potential gender differences are impacted by alcohol consumption. The results of the current study provide valuable information on the possible gender differences in emotion recognition, in alcohol-intoxicated individuals. Specifically, it was found that despite there being subtle differences in the pattern of alcohol-intoxication impairments within gender groups, there was no

overall meaningful gender differences in the detection of the six basic emotions, across various intensity levels. Suggesting gender may only have minimal involvement in the moderation of negative social behaviours in alcohol-intoxication.

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Appendix A: Inferential and Demographic Statistics for Baseline Measures

	Alcohol				Placebo				Inferential Statistics		
	Male	95% CI	Female	95% CI	Male	95% CI	Female	95% CI	F(1,106)	*p*	*Cohen's d*
K10	14.31 (3.56)	[13.01, 15.61]	15.12 (4.46)	[13.47, 16.77]	13.77 (3.55)	[12.41, 15.13]	14.74 (2.99)	[13.61, 15.87]			
Condition									0.48	.488	0.13
Gender									1.71	.194	0.25
Condition x Gender									0.01	.942	0.14
AUDIT	7.38 (3.82)	[5.99, 8.77]	6.54 (3.63)	[5.20, 7.88]	5.85 (3.30)	[4.58, 7.12]	5.30 (3.45)	[3.99, 6.60]			
Condition									4.15	.044	0.39
Gender									1.05	.308	0.20
Condition x Gender									0.05	.829	0.00
Emotion-Recognition	20.52 (2.59)	[19.58, 21.46]	21.86 (2.26)	[21.02, 22.70]	20.62 (2.71)	[19.58, 21.66]	21.40 (2.56)	[20.43, 22/37]			
Condition									0.13	.717	0.07
Gender									4.87	.030	0.03
Condition x Gender									0.32	.572	0.11
ACS-AN	18.45 (2.25)	[17.63, 19.27]	18.89 (1.89)	[18.19, 19.59]	18.64 (2.07)	[17.84, 19.44]	18.37 (2.13)	[17.57, 19.17]			
Condition									0.15	.703	0.07
Gender									0.04	.846	0.04
Condition x Gender									0.77	.382	0.17
TLFB	20.38 (18.06)	[13.81, 26.95]	20.86 (15.31)	[15.19, 26.53]	20.0 (18.93)	[12.72, 27.28]	12.48 (10.77)	[1.45, 16.54]			
Condition									2.04	.157	0.28
Gender									1.31	.255	0.22
Condition x Gender									1.70	.195	0.00

Note. Means are provided with standard deviation in brackets (SD). K10 = Kessler Psychological Distress Scale; AUDIT = Alcohol Use Disorders Identification Test; TLFB = Timeline Follow-back; ACS-AN = Advanced Clinical Solutions-Affect Naming. Respective main and interaction effects for age and education are also shown. Condition = Main effect of condition; Gender = Main effect of gender; Condition × Gender = Condition and Gender Interaction. CI = Confidence Interval.

Appendix B: Ethics Approval

Office of Research Services
University of Tasmania
Private Bag 1
Hobart Tasmania 7001
Telephone + 61 3 6226 7479
Facsimile + 61 3 6226 7148
Email Human.Ethics@utas.edu.au
www.research.utas.edu.au/human_ethics/

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

17 May 2016

Dr Cynthia Honan
C/o- Psychology

Sent via email

Dear Dr Honan

REF NO: H0015633
TITLE: Alcohol intoxication and social cognition: an examination of perception and response to social information

Document
Application Form – NEAF
Protocol – Alcohol Study
Psychology Peer Review

The Tasmanian Health and Medical Human Research Ethics Committee considered and approved the above documentation on **10 May 2016** to be conducted at the following site(s):

University of Tasmania

Please ensure that all investigators involved with this project have cited the approved versions of the documents listed within this letter and use only these versions in conducting this research project.

This approval constitutes ethical clearance by the Health and Medical HREC. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approvals of other bodies or authorities are required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the *National Statement on the Ethical Conduct in Human Research* (NHMRC 2007 updated 2014).

Therefore, the Chief Investigator's responsibility is to ensure that:

(1) The individual researcher's protocol complies with the HREC approved

protocol.

(2) Modifications to the protocol do not proceed until **approval** is obtained in writing from the HREC. Please note that all requests for changes to approved documents must include a version number and date when submitted for review by the HREC.

(3) Section 5.5.3 of the National Statement states:

Researchers have a significant responsibility in monitoring approved research as they are in the best position to observe any adverse events or unexpected outcomes. They should report such events or outcomes promptly to the relevant institution/s and ethical review body/ies and take prompt steps to deal with any unexpected risks.

The appropriate forms for reporting such events in relation to clinical and non-clinical trials and innovations can be located at the website below. All adverse events must be reported regardless of whether or not the event, in your opinion, is a direct effect of the therapeutic goods being tested. http://www.utas.edu.au/research-admin/research-integrity-and-ethics-unit-rieu/human-ethics/human-research-ethics-review-process/health-and-medical-hrec/managing-your-approved-project

(4) All research participants must be provided with the current Patient Information Sheet and Consent Form, unless otherwise approved by the Committee.

(5) The Committee is notified if any investigators are added to, or cease involvement with, the project.

(6) This study has approval for four years contingent upon annual review. A *Progress Report* is to be provided on the anniversary date of your approval. Your first report is due **10 May 2017.** You will be sent a courtesy reminder closer to this due date.

(7) A *Final Report* and a copy of the published material, either in full or abstract, must be provided at the end of the project.

Should you have any queries please do not hesitate to contact me on (03) 6226 2764.

Yours sincerely

Heather Vail
Ethics Administrator
Office of Research Services
Email: Heather.vail@utas.edu.au
University of Tasmania
Private Bag 01 Hobart Tas 7001

Dear Dr Honan

Ethics Ref: H0015633
Title: Alcohol-intoxication and social cognition: an examination of perception and response to social information

This email is to confirm that the following amendment was approved by the Chair of the Tasmania Health and Medical Human Research Ethics Committee on 10/5/2017:

Amendment Additional brief questionnaire
Miscellaneous Questionnaire Narcissistic Personality Inventory
Application Form NEAF - revised
Information Sheet PICF 2017
Amendment Additional Associate Researchers - Ms Stefania Franja, Miss Carly James and Mr Jason Turner

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the National Statement on Ethical Conduct in Human Research (NHMRC 2007).

This email constitutes official approval. If your circumstances require a formal letter of amendment approval, please let us know.

Should you have any queries please do not hesitate to contact me.

Kind regards

Heather Vail

--
Heather Vail
Ethics Officer
Office of Research Services
University of Tasmania
Private Bag 01
Hobart TAS 7001
Phone: (03) 6226 6254
Fax: (03) 6226 2765
Email: Heather.Vail@utas.edu.au
Web: http://www.utas.edu.au/research-admin

Appendix C: Participant Flyer

UTAS

Research Volunteers Wanted

Alcohol and Social Ability Study

Are you aged between 18-35 years?

Do you have some experience with alcohol?

We are looking for healthy volunteers to participate in a study investigating the effects of alcohol on social abilities such as emotion perception.

As a participant you will be asked to complete some brief baseline assessment tasks and questionnaires, consume some beverages (which may contain alcohol), and undertake some computer-based assessment tasks. The testing should take no longer than 2 hours to complete, although you must remain with the researchers until a BrAC level of .03% is achieved (0.0% for provisional licence drivers).

To volunteer or for more information, please email alcoholstudylaunceston2017@gmail.com

Receive a Village Cinemas movie ticket VILLAGE CINEMAS

This study has been approved by the Tasmanian Health and Medical Human Research Ethics Committee (#H0015633)

Appendix D: Information Sheet

School of Psychology
University of
Tasmania

Information Sheet
The Impact of Alcohol Consumption on Social Ability

March 2017

Introduction

You are invited to participate in an experiment examining the effect of alcohol on social ability. The research is being conducted by Dr Cynthia Honan and Dr Matt Palmer. Assisting with the study are Research Assistants Miss Sarah Skromanis and Mrs Stefania Franja. Miss Carly James and Mr Jason Turner will also be assisting as partial fulfilment of the requirements of an Honours degree at the University of Tasmania. Sarah, Stefania, Carly and Jason are being supervised by Dr Cynthia Honan, a Clinical Neuropsychologist and Lecturer from the Discipline of Psychology, School of Medicine, University of Tasmania.

What is the purpose of the study?

The purpose of this study is to investigate how alcohol interferes with social ability. Emotion perception and theory of mind ability (ability to understand the thoughts and behaviours of others), and the ability to inhibit automatic social responding will be specifically examined. These abilities will be assessed using cognitive tasks.

Who can participate?

We are seeking participants who are:

- Aged 18-35 years
- Speak and read fluent English
- Completed Year 10 or equivalent
- Normal or corrected-to-normal vision
- Healthy (no history of significant neurological disorder or current psychiatric disorder, significant intellectual disorder, alcohol/drug dependence, regular tobacco use, or chronic health problems)
- Regular alcohol consumers (minimum consumption of 2 standard alcoholic drinks on one occasion in the preceding month)
- Not currently using illicit drugs (i.e. use in the past six months)
- Not taking prescription medication (contraceptive medication allowed)
- Able to attend the Newnham campus of the University of Tasmania for 3 hours between 9am and 7pm (session lengths are an estimate only).

What does participation in the study involve?
This research will be conducted in Buildings O and N at the Newnham Campus, University of Tasmania. Interested individuals will complete some online screening questionnaires that will ask for your demographic details (e.g., age, sex, education), height and weight (to calculate Body Mass Index), medical history, psychological functioning, and use of alcohol. Eligible participants will be contacted to attend the Newnham campus for an experimental session conducted between 9am and 7pm.

Experimental sessions:
At the beginning of the session participants will consume a 150ml beverage before completing questionnaires asking about alcohol intake in the previous month, current mood, and level of self-interest, and brief cognitive tasks assessing basic emotion perception and inhibition ability. Participants will then be asked to consume a 750ml beverage that will contain either a placebo or alcohol. Alcohol administered will be a maximum of 6 standard alcoholic drinks. Participants will not be informed of the beverage content administered in each session until the conclusion of the session.

After consuming the beverage, participants will be asked to complete an emotion recognition task, and either tasks assessing inhibition ability or the ability to understand the thoughts and intentions of another person (theory or mind). A breathalyser will be used to monitor participants' breath alcohol concentration throughout the duration of the study. Throughout testing, participants will also be asked to complete several scales assessing their feeling of intoxication and impairment.

While it is estimated that the experimental tasks will take approximately 100 minutes to complete, some participants may be required to remain in the laboratory for a total of 3 hours to ensure each participant records two consecutive breath alcohol readings of .03% or less (.00% for Provisional licence holders intending to drive). These times are an estimate only as individual rates of alcohol absorption and elimination may vary. Participants will be debriefed regarding the order of dose administration at the conclusion the session.

What are the restrictions regarding participating?
Participants will be asked to fast from food for 4 hours prior to each experimental session, although we ask that participants consume two slices of toast with their choice of spread 60 minutes prior to the session. Toast will be available from the researchers if required. Prior to fasting, a standard light meal devoid of high-fat or dairy products (e.g., a sandwich) is advised.
Participants will be asked to abstain from caffeine for 8 hours and alcohol and over-the-counter medication for 24 hours prior to each session. Participants will be asked to abstain from illicit drugs and tobacco for the duration of participation. At the end of each session, participants will remain at leisure (with food and entertainment provided) until they attain two consecutive breathalyser recordings of 0.03% or less measured 15 minutes apart. Participants holding their provisional driver licence, who are intending to drive will be required to

remain in the laboratory until two consecutive BrAC measurements are recorded at .00%. Participants holding their provisional licence who are not intending to drive, will be able to leave the laboratory at .03% BrAC if they sign a declaration in which they agree to be escorted by a nominated guardian to their place of residence and accompanied for a two hour period following session completion. The nominated guardian must be an adult aged 18 years or older who: (i) holds their provisional or full driver licence (ii) directly collects the participant from the research premises and meets the researcher in-person, and (iii) signs a declaration agreeing to escort the participant directly to their place of residence and accompany the participant for the two hour period following session completion. The researcher reserves the right to retain participants in the laboratory until .03% BrAC for those holding their full driver licence and .00% BrAC for those holding their provisional licence when it is deemed unsafe for the participant to leave at .03% BrAC.

What are the benefits of participating?
Your participation will help us enhance our knowledge of the effects of alcohol on social ability, and specifically, the mechanisms underlying social disinhibition, theory of mind and emotion perception. This knowledge can be used to educate people regarding the potential outcomes of alcohol-intoxication on social functioning and will inform further research that aims to investigate alcohol-related social difficulties.

What are the risks associated with participating?
There are no anticipated risks of this research. However, if in the unlikely event you experience negative side-effects, please inform the experimenter and the necessary assistance will be sought and provided. We ask that participants refrain from consuming alcohol or operating heavy machinery for four hours post-session.

Is there any reimbursement for participation?
Students of the University of Tasmania who are undertaking KHA111/112 unit will receive three hours of research participation credit for their time. Participants who are not undertaking KHA111/112 units will receive a Village Cinemas movie ticket as recompense for their time. Participants who do not complete the full schedule of sessions will not receive a movie ticket, unless withdrawal is necessary due to an unexpected adverse physiological reaction to the investigatory products.

How do I volunteer to participate? What if I want to withdraw from participating? Participation in this study is voluntary. By signing the attached consent form, you are indicating that you are aware of the nature of the study and wish to participate. While we would be pleased to have you participate, we respect your right to decline. There will be no consequences to you if you decide not to participate. If you decide to discontinue participation at any time, you may do so without providing an explanation. However, you will be required to remain in the laboratory until your breath alcohol concentration measurement equals 0.03% or less on two separate occasions measured 15 minutes apart.

What will happen to the information I provide?
All information collected will be kept confidential. Each participant will be assigned a treatment code and individual participant data will be identifiable only by that code. All of the data will be stored on password protected secure computers or in a locked cabinet in the Department of Psychology, School of Medicine for a minimum of five years after the publication of any academic journal articles, at which point all questionnaires will be destroyed using a paper shredder and electronic data will be deleted. The screening questionnaire will be securely destroyed immediately on completion of the study and that any information provided by the participant on the questionnaire will be identifiable only by participant number, kept confidential, and viewed only by the experimenter.

Who do I contact if I have any queries?
If you would like to discuss any aspect of this study please contact Sarah Skromanis (sarah.skromanis@utas.edu.au), Stefania Franja (sfranja@utas.edu.au), Carly James (carlyj@utas.edu.au), and Jason Turner (jturner7@utas.edu.au). Alternatively, you can contact Dr Cynthia Honan on (03) 6324 3266 or by email cynthia.honan@utas.edu.au; or Dr Matt Palmer on (03) 6324 3004 or matt.palmer@utas.edu.au.

How do I find out the results of the study?
A summary of the results will be available on the Research webpage of the Discipline of Psychology, University of Tasmania (http://www.utas.edu.au/health/study/psychology). Results of the study can also be provided by contacting the researchers directly. Feedback on individual performance will not be provided.

Who do I contact if I have a complaint about the study?
This study has been approved by the Tasmanian Health and Medical Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study should contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote **H0015633**.

Who do I contact if I wish to speak to someone about my alcohol or drug use, or mental health?
As aforementioned, a number of simple screening questionnaires will be administered assessing psychological functioning and alcohol and other drug use. Whilst it is not anticipated that these questionnaires will cause distress, please do not hesitate to let the researcher know if you do not wish to fill them in. If you are concerned about your drinking or mental health, please contact the Tasmanian Alcohol Drug Information Service 1800 811 994 or Lifeline 13 11 14 (both services available 24 hours a day).

Thank you for taking the time to consider this study.
If you wish to take part in it, please sign the attached consent form.
This information sheet is for you to keep.

Appendix E: Participant Consent Form

School of Psychology
University of Tasmania

Consent Form

The Impact of Alcohol Consumption on Social Ability

1. I have read and understood the 'Information Sheet' for this project.
2. The nature and possible effects of the study have been explained to me.
3. I understand that because of my prior participation in eligibility screening session in which I have completed measures of psychological distress and alcohol use, as well as reporting my correct demographic data (age, sex, height and weight) that I am eligible to participate in the study.
4. I understand that I will be asked to abstain from food for 4 hours (and consume 2 slices of toast 60 minutes prior to the session), caffeine-containing products for 8 hours, and alcohol and prescription medication for 24 hours prior to each session, and illicit drugs and tobacco for the duration of the study.
5. I will be asked to sign a declaration and complete a breath alcohol concentration measurement (via a breathalyser) to confirm my abstinence at the start of each session.
6. I understand that in the experimental session I may be given a maximum of 6 standard alcoholic drinks, and that I will not be informed of the specific contents of the beverage until the conclusion of testing. I understand that after beverage consumption, I will be asked to complete a number of computerised laboratory behavioural performance tasks during which my behavioural responses will be recorded. I understand that my breath alcohol concentration (as measured via a breathalyser) will be recorded throughout the session, and that I will be asked about my perception of my intoxication and level of impairment.
7. I understand that the study involves attending the Newnham campus of the University of Tasmania (Buildings O and N) for one 100 minute experimental session.
8. I understand that I will be asked to remain in the laboratory until my blood alcohol concentration equals 0.03% or less on two occasions measured 15 minutes apart. This may mean remaining in the laboratory for approximately 3 hours in total.
9. I acknowledge that I have been advised to refrain from drinking alcohol or operating a vehicle or other heavy machinery for four hours after the end of the experimental session.
10. I understand that if I hold a provisional driver licence and I intend to drive I will be required to remain in the laboratory until my breath alcohol concentration is .00% on two consecutive occasions. I understand that if I hold a provisional driver licence and do not intend to drive I will be able to leave the laboratory at .030% BrAC after signing a declaration in which I agree to be escorted by my nominated legal adult to my place of residence and be accompanied for a two hour period following session completion. I understand that the nominated legal guardian must be an adult aged 18 years or older

who: (i) holds their provisional or full driver licence (ii) directly collects me from the research premises and meets the researcher in-person, and (iii) signs a declaration agreeing to escort me directly to my place of residence and accompany me for a two hour period following session completion. Furthermore, I understand that the researcher reserves the right to retain participants in the laboratory until .03% BrAC for those holding their full driver licence and .00% BrAC for those holding their provisional licence when it is deemed unsafe for the participant to leave at .03% BrAC. I acknowledge that I have been advised to refrain from drinking alcohol or operating a vehicle or other heavy machinery for four hours after the end of experimental sessions.

11. I understand that if I am a KHA111/112 student will receive three hours of research participation credit. If I am not a KHA111/112 student I understand that I will receive a Village Cinemas Movie ticket for my participation. If I withdraw from the study prior to concluding all sessions I will not be eligible for reimbursement, unless the withdrawal is due to an unexpected adverse event occurring as a consequence of ingesting the beverage.
12. I understand that, while there are no anticipated risks associated with this study, I should inform the experimenter immediately if any unexpected negative side-effects are experienced. I understand the experimenter will immediately cease the session and seek the necessary assistance.
13. I understand that the researchers will maintain my confidentiality and that any information I supply to the researcher(s) will be used only for the purposes of the research. My data will only be identifiable by an individual numerical participant code and I will not be able to obtain individual feedback of my results.
14. I understand that the screening questionnaire will be securely destroyed immediately on completion of the study and that any information I provide on the questionnaire will be identifiable only by my participant number, kept confidential, and viewed only by the experimenter.
15. I understand that all research data will be securely stored on the University of Tasmania premises for at least five years, and will then be securely destroyed when no longer required.
16. I agree that research data gathered from me for the study may be published provided that I cannot be identified as a participant.
17. I agree to participate in this investigation and understand that I may withdraw at any time without any effect, and if I so wish, may request that any data I have supplied to date be withdrawn from the research.
18. Any questions that I have asked have been answered to my satisfaction.

Name of Participant: _____

Signature: _____ Date: _____

Statement by Investigator

☐ I have explained the project & the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

☐ The participant has received the Information Sheet where my details have been provided so participants have the opportunity to contact me prior to consenting to participate in this project.

Name of investigator: _____

Signature of investigator: _____ Date: _____

Appendix F: Declaration of Abstinence

Declaration of Abstinence Compliance

The Impact of Alcohol Consumption on Social Ability

Participants are required to abstain from the following prior to the experimental session:

- No nicotine and illicit drugs for the duration of participation
- No alcohol for 24 hours
- No prescription or over-the-counter medication (except the contraceptive pill)
- No caffeine-containing products for 8 hours
- No food for 4 hours (preceded by a light meal not containing oil/dairy/caffeine)

Participants are also asked to consume two slices of bread/toast 60 minutes prior to the experimental session and limit their fluid intake in the four hours prior to participation

I have complied with the above guidelines prior to this session.

Signature of participant: ..... Date: .....

Signature of experimenter: ..... Date:.....

Appendix G: Widmark Equation

Alcohol Dose (mg) = $W\rho(C1 + \beta t)$

W	Participants body weight (kg),
ρ	Distribution of alcohol in the body
C1	target breath alcohol concentration (BrAC; g/100mL),
t	*Time (Hours)*
β	Rate of alcohol elimination. Set at 0.015g/100mL/hour.

Note: Final alcohol dose (mg) is divided by 0.8 to achieve a dose in millilitres.